CLAIMS

1. A highly branched perfluoroolefin represented by the following general formula (1):

$[(CF_3)_2CF][(CF_3)_2CY]C=C(CF_3)Z$ (1)

in the formula, Y and Z are the same or different and each represents F or Rf, Rf represents a straight or branched perfluoroalkyl group having 1 to 16 carbon atoms, provided that Y and Z are not simultaneously F.

2. The highly branched perfluoroolefin according to Claim 1,

wherein Y represents Rf.

3. The highly branched perfluoroolefin according to Claim 2,

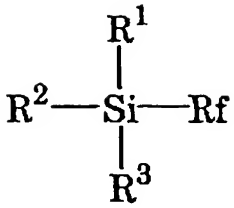
which is perfluoro(2,4,4-trimethyl-3-isopropyl-2-pentene) or perfluoro(4,4-dimethyl-3-isopropyl-2-pentene).

4. The highly branched perfluoroolefin according to Claim 1,

which is perfluoro(2,4-dimethyl-3-isopropyl-2-pentene).

5. A production method of a perfluoroolefin for producing the highly branched perfluoroolefin according to Claim 1,

which comprises reacting a hexafluoropropene trimer with a trialkylperfluoroalkylsilane represented by the following general formula (2):



(2)

in the formula, Rf represents a straight or branched perfluoroalkyl group having 1 to 16 carbon atoms, R^1, R^2 and R^3 are the same or different and each represents an alkyl group having 1 to 3 carbon atoms,

in an aprotic polar solvent using a fluoride ion as a catalyst.

6. The production method of the perfluoroolefin according to Claim 5,

wherein the trialkylperfluoroalkylsilane is trifluoromethyltrimethylsilane.

7. The production method of the perfluoroolefin according to Claim 6,

wherein the aprotic polar solvent is 1,3-dimethyl-2-imidazolidinone and

wherein a highly branched perfluoroolefin (A) represented by the following general formula (3):

$[(CF_3)_2CF]_2C=C(CF_3)Rf$ (3)

in the formula, Rf represents a straight or branched perfluoroalkyl group having 1 to 16 carbon atoms,

is obtained selectively.

8. The production method of the perfluoroolefin according to Claim 7,

wherein the highly branched perfluoroolefin (A) is obtained at a yield of 60% by weight or higher.

9. The production method of the perfluoroolefin

according to Claim 7,

wherein the highly branched perfluoroolefin (A) is perfluoro(2,4-dimethyl-3-isopropyl-2-pentene).

10. A production method of a super-stable perfluoroalkyl radical

which comprises producing a super-stable perfluoroalkyl radical represented by the following general formula (1R):

$[(CF_3)_2CF]_i[(CF_3)_2CY]Ra\text{-}CF(CF_3)Z$ (1R)

in the formula, Ra represents a carbon atom having one unpaired electron, Y and Z are the same or different and each represents F or Rf, and Rf represents a straight or branched perfluoroalkyl group having 1 to 16 carbon atoms, provided that Y and Z are not simultaneously F,

by fluorinating the highly branched perfluoroolefin according to Claim 1.

11. The production method of the super-stable perfluoroalkyl radical according to Claim 10,

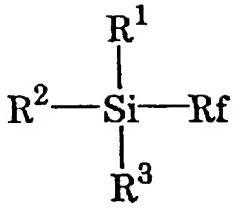
wherein the fluorination is conducted using a fluorine gas.

12. The production method of the super-stable perfluoroalkyl radical according to Claim 11,

wherein the fluorine gas is a pure one.

13. The production method of the super-stable perfluoroalkyl radical according to Claim 10,

wherein the highly branched perfluoroolefin is one obtained by reacting a hexafluoropropene trimer with a trialkylperfluoroalkylsilane represented by the following general formula (2):



(2)

in the formula, Rf represents a straight or branched perfluoroalkyl group having 1 to 16 carbon atoms, R^1, R^2 and R^3 are the same or different and each represents an alkyl group having 1 to 3 carbon atoms,

in an aprotic polar solvent using a fluoride ion as a catalyst.

14. The production method of the super-stable perfluoroalkyl radical according to Claim 10,

wherein Y and Z are the same or different and each represents F or a trifluoromethyl group, provided that Y and Z are not simultaneously F.

15. The production method of the super-stable perfluoroalkyl radical according to Claim 10,

wherein the highly branched perfluoroolefin is perfluoro(2,4-dimethyl-3-isopropyl-2-pentene), perfluoro(2,4,4-trimethyl-3-isopropyl-2-pentene) or perfluoro(4,4-dimethyl-3-isopropyl-2-pentene).

16. A production method of a reduced-carbon super-stable perfluoroalkyl radical

which comprises producing a super-stable perfluoroalkyl radical (AR) represented by the following general formula (3R):

$[(CF_3)_2CF]_2Ra\text{-}CF(CF_3)Rf$ (3R)

in the formula, Ra represents a carbon atom having one unpaired electron and Rf represents a straight or branched perfluoroalkyl group having 1 to 16 carbon atoms,

by fluorinating a highly branched perfluoroolefin (B) represented by the following general formula (4):

$[(CF_3)_2CF][(CF_3)_2CRf]C=C(CF_3)Rf$ (4)

in the formula, each Rf is the same or different from each other and is defined as described above.

17. The production method of the reduced-carbon super-stable perfluoroalkyl radical according to Claim 16,

wherein Rf represents a trifluoromethyl group.

18. A super-stable perfluoroalkyl radical (BR) represented by the following general formula (4R):

$[(CF_3)_2CF][(CF_3)_2CRf]Ra-CF(CF_3)Rf$ (4R)

in the formula, Ra represents a carbon atom having one unpaired electron and each Rf is the same or different from each other and represents a straight or branched perfluoroalkyl group having 1 to 16 carbon atoms.

19. The super-stable perfluoroalkyl radical according to Claim 18,

which is perfluoro(2,4,4-trimethyl-3-isopropyl-3-pentyl).

20. A super-stable perfluoroalkyl radical (CR) represented by the following general formula (5R):

$[(CF_3)_2CF][(CF_3)_2CRf]Ra-CF_2(CF_3)$ (5R)

in the formula, Ra represents a carbon atom having one unpaired electron and Rf represents a straight or branched perfluoroalkyl group having 1 to 16 carbon atoms.

21. The super-stable perfluoroalkyl radical according to Claim 20,

which is perfluoro(4,4-dimethyl-3-isopropyl-3-pentyl).